Opening up Australian preschoolers' lunchboxes

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Abstract
Objective: Early childhood services have been identified as key settings for promoting healthy eating and obesity prevention. However, little is known about the obesity-related behaviours of preschool-aged children or food-related policies in these settings. The purpose of this study was to describe the contents of preschoolers’ lunchboxes to inform future interventions. Methods: Cross-sectional survey of 259 children attending preschools in the Sydney West and Sydney South West regions of New South Wales in 2008. Lunchbox data were collected using a purpose-designed audit tool. Food and beverages were classified as fruit, vegetables, dairy, breads and cereals, ‘extra’ (energy-dense) foods, ‘extra’ drinks or water. Results: Sandwiches and home-cooked meals were the most frequently identified food item, found in 92% of children’s lunchboxes, followed by fresh fruit. However, 60% of lunchboxes contained more than one serve of extra food or drink. Conclusion: While nutrition guidelines allow one to two serves of extra foods per day for preschool-aged children, the majority of children appear to consume most of this allocation during their school day, potentially contributing to overconsumption of extra foods and excess kilojoule intake. Implications: Preschool food policies may help to guide the content of children’s lunchboxes, however this study emphasises the need for better communication and enforcement of these policies, as well as broader public policy changes.

Keywords
opening, lunchboxes, up, australian, preschoolers

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Opening up Australian preschoolers’ lunchboxes

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Childhood overweight and obesity is a public health concern in Australia, with almost one in four children aged 2 to 17 years carrying excess weight. Rising levels of childhood obesity are likely to have major health consequences: there has been a demonstrated tracking of overweight and obesity from childhood into adulthood, and there is evidence that the precursors for diabetes and cardiovascular disease, some of which may be irreversible, already exist in overweight and obese children.

There is convincing evidence that a high intake of energy-dense or ‘extra’ foods is a causal factor in the development of overweight and obesity. Therefore, the over-consumption of extra foods by Australian children, which can contribute up to 42% of the total energy intake of younger children aged 5 to 12, is of concern. This intake significantly exceeds national recommendations for extra food consumption. The Australian Guide to Healthy Eating (AGHE) defines extra foods as those that are not essential to provide necessary nutrients, and typically contain too much added fat, salt and sugars. The AGHE recommends between one to two serves of extra foods per day for children, or 14% of their total energy intake.

While the consumption of extra foods increases with age, a study of toddlers’ diets showed that extra foods contributed to 27% of their daily energy intake. In fact, many behaviours that are linked to inappropriate weight gain, such as eating habits and food preferences, are formed during the first few years of life, suggesting that this age group is an important target population for obesity prevention.

Early childhood services, such as preschools, have been identified as a key setting for promoting healthy eating and obesity prevention, both to influence children’s daily habits and as a means of communicating health messages to families. In Australia, seven out of 10 (72%) children aged 3 to 6 years who were not attending primary school were usually attending a preschool or a preschool program in long day care.

At the majority of Australian preschools food is brought from home, yet there is only limited published information available on the nutritional quality of preschool children’s lunchboxes. A study that assessed the contents of children’s lunchboxes from 15 long day care centres in Sydney in 2003 found that a low proportion of lunchboxes met criteria for the provision of calcium rich foods offered and vegetables, as outlined by NSW Health Department guidelines. As well, one recent cross-sectional survey of children’s food consumption at primary schools in Victoria, Australia, indicated that school students’ lunchboxes contain foods and drinks that are high in sugar and fat and low in nutritional value (i.e. ‘extras’).

Information on the nutritional adequacy of preschoolers’ lunchboxes is needed in order to guide the development of relevant nutrition and obesity prevention programs and policy within the early childhood sector. The aim of this study was to provide a descriptive analysis of the content of lunchboxes among children aged 3 to 5 years attending preschools in NSW.
Methods

Design

All preschools run under the auspices of the NSW Department of Education and Training and located in the Sydney West and Sydney South West education regions of NSW were invited to participate in the study (N=61). Children and their parents were invited to participate from consenting preschools. Informed consent from parents or guardians of the children was a requirement for participation. This research comprises the baseline data for the evaluation of Munch and Move, an early childhood healthy eating and physical activity program funded by the NSW Department of Health. Ethics approval was granted by The University of Sydney Human Research Ethics Committee.

Data were collected between May and June 2008. Each preschool was visited at the start of the school day (prior to the children consuming any food or drink) by a field team of three or four members, constituted from a pool of 10 trained research officers (ROs). ROs attended a one-day training session where they were trained in the use of the lunchbox audit tool. Preschools were advised of the date of visit 24 hours in advance and asked not to disclose this to parents.

Measures

Parent and teacher surveys

Parents completed a written survey that included information on their child’s sex, date of birth, postcode of residence and the main language spoken at home. Postcode of residence was used as a proxy for socio-economic status, based on the Australian Bureau of Statistics’ (ABS) Index of Relative Socioeconomic Disadvantage (IRSD), and was used to classify students socio-economic status (SES) (low or middle/high). The IRSD describes the socio-economic aspects of geographical areas and includes indices on income, educational attainment, unemployment and the proportion of people in unskilled occupations. Language spoken most at home was used to categorise students into English-speaking or non-English-speaking backgrounds, using the ABS Australian Standard Classification of Languages.

The principal teacher at each preschool was interviewed and asked whether the preschool had rules or policies relating to food and beverages that children could bring to preschool. The presence of these rules/policies was recorded, as well as a brief description on what these specified.

Lunchbox audit

A lunchbox audit tool similar to that used in a school-based study was designed by one of the authors who is a senior research dietitian (BK). The tool required details of all food and beverage items, including brand name, product description and weight (grams or millilitres) to be recorded separately for each child. Electronic scales were used to measure the weight of all food and beverages where this was not indicated on packages.

Coding and classification of all food items was conducted by BK. Food and beverage classification and serving size was based on the AGHE, where one serve of fruit was equivalent to 150 g; one serve of vegetables 75 g; one serve of extra foods 600 kJ; and 375-730 kJ represented one serve of dairy. All food and beverages were then classified as one of seven major food and beverage categories; either fruit, vegetables, dairy, breads and cereals, ‘extra’ foods, water or ‘extra’ drink, and also according to food and beverage sub-groups (Table 2).

The overall contents of each lunchbox were also categorised by the extent to which they corresponded to nutritional recommendations on limiting extra foods and consuming core foods. Three lunchbox categories were developed:

i. balanced: containing at least a sandwich or home-cooked meal and the presence of either fruit or vegetables, with the allowance of one extra serve (food or beverage);

ii. over-loaded with extra food or beverage: containing >1 extra food or beverage serve in addition to the contents of the balanced lunchbox; and

iii. unbalanced and/or over-loaded with extra food or beverage: containing one or fewer balanced lunchbox components and/or too many extra food or beverage serve (>1), or no lunchbox.

School children are estimated to consume approximately one-third of their total energy intake at school. As the AGHE recommends between one and two extra foods per day for preschool aged children, 0.7 serves of extra food were estimated to meet this recommendation. This value was rounded up for practical purposes, so that an upper threshold of one extra food item was calculated to represent a balanced lunchbox.

Analysis

Data were analysed using SPSS Complex Samples (Version 17 for Windows, Chicago, IL, US) to account for the clustered design of the study and adjust for the standard errors. For the analysis, SES and language backgrounds were dichotomised into low and middle/high SES groups and English-speaking and non-English-speaking backgrounds. Descriptive statistics (means and standard deviations) were used to describe the contents of lunchboxes. Pearson’s chi-squared tests were used to compare the proportion of children bringing more than one serve of extra foods and/or beverages from different socio demographic backgrounds. Statistical significance was set at $p<0.05$.

Results

Participant characteristics

Sixty-one preschoolers were invited to participate in the study and 29 (48%) agreed to be involved. Consent was obtained from the parents of 425 children within these schools (54% response rate).

Of the preschools involved in the study, four operated on a half day basis (n=40 children) and four preschools provided food for children (n=89 children). These were excluded from the lunchbox audit study. Thirty-seven children were absent on the day of the visit. This generated 259 lunchboxes for the lunchbox audit study.
Table 1 shows the characteristics of the children whose lunchboxes were audited. The mean age of children was 4.4 years with a greater proportion of children from low SES families (58%) and from English speaking backgrounds (58%).

**Contents of preschool children’s lunchboxes**

Overall, sandwiches and home-cooked meals were the most frequently identified food item, found in 92% of children’s lunchboxes. This was followed by fresh fruit, high fat/low fibre savoury snacks, water and fruit drinks (Table 2). For those lunchboxes that contained any extra foods, the average number of serves was 1.8 serves per lunchbox. For those lunchboxes that contained greater than one serve of extra food or beverages (60% of lunchboxes), the average number of serves brought was 2.0 serves per lunchbox.

**Composition of overall lunchboxes**

The highest proportion of lunchboxes were categorised as ‘overloaded with extras’ (38%), followed by ‘balanced’ lunchboxes (33%) and ‘unbalanced and/or over-loaded with extras’ comprised 29% of lunchboxes.

**Table 1: Demographic characteristics of the children involved in the lunchbox audit study.**

<table>
<thead>
<tr>
<th>Socio-demographic characteristics</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>122 (47)</td>
</tr>
<tr>
<td>Female</td>
<td>197 (53)</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>32 (12)</td>
</tr>
<tr>
<td>4</td>
<td>212 (82)</td>
</tr>
<tr>
<td>5</td>
<td>14 (5)</td>
</tr>
<tr>
<td><strong>Indigenous status</strong></td>
<td></td>
</tr>
<tr>
<td>Aboriginal or Torres Strait Islanders</td>
<td>12 (5)</td>
</tr>
<tr>
<td>Not Aboriginal or Torres Strait Islanders</td>
<td>239 (92)</td>
</tr>
<tr>
<td>Unknown</td>
<td>8 (3)</td>
</tr>
<tr>
<td><strong>Socioeconomic status</strong></td>
<td></td>
</tr>
<tr>
<td>High/Middle</td>
<td>110 (42)</td>
</tr>
<tr>
<td>Low</td>
<td>149 (58)</td>
</tr>
<tr>
<td><strong>English spoken at home</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>148 (58)</td>
</tr>
<tr>
<td>No</td>
<td>107 (42)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>299 (100)</td>
</tr>
</tbody>
</table>

N/A — No serving size recommendation available

All lunchboxes that were classified as either ‘balanced’ or ‘overloaded with extras’ contained either a sandwich or home-cooked meal and fruit or vegetables, compared with those that were classified as ‘unbalanced and/or overloaded with extras’, where 46% had a sandwich or home cooked meal and 13% had fruit or vegetables (Figure 1). Lunchboxes that were classified as ‘unbalanced and/or over-loaded with extras’ were also less likely to contain water, milk and other dairy foods.

**Extra foods and beverages by socio-demographic group**

Overall, 60% of children’s lunchboxes had greater than one serve of extra food or beverage items. A similar proportion of children from low and middle/high SES backgrounds had lunchboxes containing more than one serve of extra food and/or beverage (58% vs. 57%) ($\chi^2 = 0.32, p=0.86$). While children from non-English
speaking backgrounds contributed to a greater proportion of lunchboxes containing greater than one serve of extra food and/or beverage (65%), compared with children from English speaking backgrounds (53%) this difference was not statistically significant ($\chi^2 = 3.532, p=0.06$).

**Preschool food and beverage policies**

Almost all (86%) the preschools reported that they had a school policy on food and beverages brought to school by children. These policies mostly related to the preclusion of extra foods, such as chips, confectionery and soft drink. However, few preschools had a comprehensive list of extra foods and beverages that were not allowed. In 44% of those preschools with food policies, information was provided to parents in orientation kits, 24% included information in newsletters or spoke with parents directly, 16% discussed their food policy at parent-teacher meetings and 12% sent letters home to parents or used the communal notice board.

**Discussion**

This study provides a cross sectional analysis of the contents of children’s lunchboxes, from a sample of 3 to 5 year olds attending state-run preschools from a range of socio-demographic areas in Sydney, Australia. While national nutrition guidelines allow for the inclusion of some extra foods in children’s diets, the majority of children appear to be consuming most of the ‘allowed’ amount of extra foods during their school day. As food and beverage intake during school hours represents only a portion of children’s overall diets (i.e. a third), this high intake of extra foods and beverages at preschool may be contributing to over-consumption of these energy-dense foods.

Specifically, almost half of all preschool children’s lunchboxes contained extra beverages. The intake of these extra drinks is particularly concerning as the high consumption of sugary drinks, such as soft drink, fruit drinks, fruit juices and cordial, are considered to contribute to overweight and obesity among children. Sugary drinks are considered to have a low satiating effect. Therefore, the consumption of these beverages may not be compensated for at later eating occasions, leading to an overall increase in energy intake. The World Health Organization has classified the association between extra drink consumption and the increased risk of obesity as probable.

This finding supports previous Australian research indicating a high level of sugary drink consumption among children and adolescents, with 35% of all children aged 2-18 years consuming sugary drinks in the 24-hour period prior to the 1995 National Nutrition Survey. This high consumption of sugary drinks also has implications for children’s dental health. In a synthesis of potential interventions to reduce children’s consumption of sugary drinks, interventions to modify the school environment, such as increasing the availability of water fountains, and school-based education programs to promote water and reduce consumption of sugary drinks were highlighted as promising strategies.

The excessive amount of extra foods and drinks in children’s lunchboxes may be influenced by parents’ knowledge and attitudes, as well as environmental factors. Parents may have had limited understanding about appropriate foods and drinks to include in children’s lunchboxes and the quantity that should be consumed. A qualitative survey of parents of primary school aged children in Victoria, Australia found that parents did not feel well-equipped to distinguish the healthiness of different pre-packaged snacks, particularly taking into account the large variety of products available and marketed to children. Alternatively, parents may simply wish to offer their children treats or rewards. Again, in this previous research, many parents believed that daily treats of unhealthy snack foods were acceptable.

In order to respond to both informational and attitudinal factors regarding an appropriate ‘healthy’ lunchbox, a mix of educational interventions as well as broader strategies that address social values are required. Informational strategies can involve providing nutrition information directly to parents as well as upstream strategies such as clearer labelling of food products. For example, traffic light food labelling has been demonstrated in consumer testing to be easily understood and interpreted by all consumers, including those from low SES backgrounds, and could assist consumers to identify healthier food products in the supermarket environment.

Strategies that limit the marketing of unhealthy food to children is a further method that could be used to reduce children’s preference for, and parent’s likelihood of purchasing, extra foods. Evidence indicates that food marketing to children in Australia is predominately for extra foods; and therefore messages about limiting such items must compete with these sophisticated and widespread marketing practices. Further, many extra food and beverage products are specifically packaged and marketed to appeal to children and to be convenient for parents to pack in lunchboxes.

The preschool environment may also have potential to be a more significant influence on children’s lunchbox contents. In this sample almost all preschools reported having a rule or policy on the types of food and beverages, including extra foods, which were permitted to be brought to preschool, although these policies did not typically include a comprehensive list of extra foods. Also, the extent to which policies were rigorously implemented was unknown. More specific rules and stricter enforcement by preschools may be warranted. This may include sending a letter home to parents who include non compliant food and beverage items in their child’s lunchbox. Further formative research to determine how best to communicate with parents on the provision of healthy foods in lunchboxes would be valuable.

However, given that the majority of children had excessive serves of extra foods and drinks in their lunchboxes, and that this finding is consistent with previous audits of school children’s lunchboxes and the high intake of extra foods in children’s overall diets, more widespread and intense actions may be required to influence families’ attitudes about the appropriate levels of extra foods in children’s diets. Therefore, a range social marketing
strategies may also be required, in addition to policy changes that limit children's exposure to unhealthy food marketing and introduce interpretive nutrition labelling on food products may be required to achieve a significant effect.

Promisingly, a high proportion of preschool children's lunchboxes contained fruit (75%), however few contained any vegetables (5%). This finding supports data from the 2007 Australian National Children's Nutrition and Physical Activity Survey, which found that while 61% of 4 to 8 year old children met the dietary recommendations for fruit (excluding juice), only 3% met the recommendations for vegetables (excluding potatoes). Greater emphasis needs to be placed on the importance of vegetable consumption.

This study had some limitations. While not specifically validated, the lunchbox audit tool was a purpose-designed tool similar to those used in other studies and developed by a senior research dietitian with experience classifying children's food for research purposes. Further, our results represent only the food and beverages brought to preschool by children, rather than the food that was actually consumed. Also, a wide range of early childhood services exist, and DET preschools comprise only a minority of these. This may have implications on the external validity of findings depending on the food policies of other providers. Finally, while the field work was conducted by 10 research officers, and inter-rater reliability was not tested, all food and beverage items were weighed and product names recorded on a standard template, which assisted to minimise measurement error. A key strength of the study was the direct observation of lunchboxes to record contents rather than using proxy-report measures.

This study provides a snapshot of the types of food and beverages that young children typically bring to preschool. The high prevalence of children bringing more than one serve of extra food and/or beverage to preschool emphasises the need for better communication and enforcement of preschool food policies, as well as broader policy changes, such as improving food labelling and restricting unhealthy food marketing to children. Future nutrition programs in preschool settings should focus on strategies to reduce the consumption of extra foods and beverages as well as increasing vegetable consumption.

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References


